South Coast AQMD Staff Responses to So Cal Gas Comments dated 3/11/2020

Ease of Use of Model:

- We were not able to download the model results into a simple format. Instead, we had to take screen shots and manually enter data into an Excel file to analyze the results. It would be helpful if the input and export data could be exported into a PDF or EXCEL format.

  Results of each run are saved in a comma-separated file (.csv) and a binary file that can be read by NEAT (.results) with all the data used to display the graphs presented by NEAT. .csv files can be directly opened with Excel or any standard text editor.

- While the NEAT model allows the user to save the model run to the disk, the NEAT tool appears to load the saved results file independently from its associated inputs file. This results in confusion, for instance, when one flips back to the "Demand" window when trying to understand the results and does not see the corresponding input parameters reflected there. It would be helpful to set up the NEAT model to couple input and result files.

  The modeling run set-up can be also saved and later loaded in NEAT. Users can load both the setup file (*.setup) and the results file (*.results) when analyzing results. The ability to load saved results or setup files was discussed in NEAT Workgroup number 6 and throughout the documentation. All NEAT Workgroup presentations and agendas are available online at www.aqmd.gov/NEAT.

Data:

- We attempted to compare the UEC for different appliances in your model. The results were unexpected and we request that you review the data in the model.

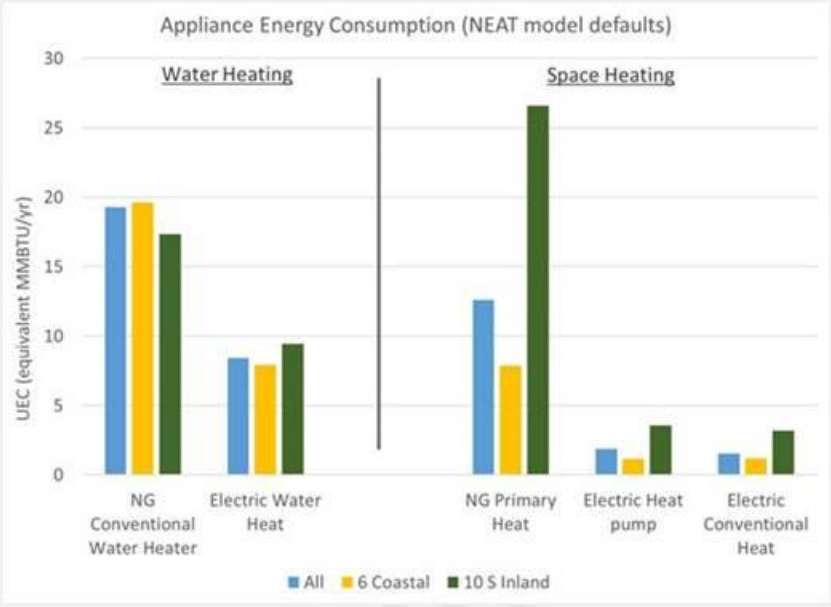

Figure 1: NEAT default appliance UEC for natural gas and electric water heaters by climate zone (converted into equivalent MMBTU/year)

  - Electric water heaters: While electric heat pump water heaters may have lower energy usage than conventional NG water heaters, we would expect the relative UEC in

different regions to follow similar trends. In the chart above, the UEC for Coastal region is higher than Inland for NG water heating. Whereas, the UEC for electric water heating is in the Inland sector. We would recommend you revisit the UEC factors for water heaters. If you have used the 2009 RASS data, there may be some disparity due to the housing stock that is electric in the coastal and Inland regions. For example, the penetration of electric water heating in the coastal region may be from smaller homes than the actual housing stock in the region.

- Electric space heating: We would expect the efficiency of a heat pump to be better than a conventional furnace, whether gas or electric. The implied UEC from our analysis shows the electric heat pump and electric conventional heat to have similar UEC for each region.

We did use 2009 RASS directly for the UEC inputs. While we acknowledge that 2009 RASS has its limitations, it is well documented and extensively vetted. Our goal is to utilize publicly available peer-reviewed datasets as an input to the tool. As discussed during working group meetings, we are open to suggestions for input dataset that has been peer reviewed and well documented. A file containing the input data in the "Demand" section of the tool was extensively reviewed by the NEAT workgroup. These parameters were also reviewed by the NEAT workgroup meeting number 2.

New data set will likely be reflected in future updates. Additionally, NEAT is designed so that users can edit/update UEC values and many other inputs should they find more up-to-date or more accurate information. A cautionary statement appears on the "Demand" section of the tool that says the following: "CAUTION: Default appliance parameters may not be appropriate for most scenarios. For the most accurate results, South Coast AQMD recommends using actual values for the appliances that are being replaced or retrofit. Note that unites of UEC vary based on fuel."

- The NEAT model uses CA-GREET 2.0 and EMFAC2014 to estimate the well-to-pump and tailpipe emissions from gasoline and diesel light duty-vehicles. Newer versions of both these models, i.e., CAGREET 3.0 and EMFAC2017 are now available.

This version of NEAT uses the best data available at the time it was programmed. Users are free to modify well-to-pump and tailpipe emissions from vehicles to reflect more up-to-date values.

Analytical Results:

- The GHG reductions are shown in aggregate. It would be useful to understand the relative contribution of different types of emissions – CO2, CH4, HFC. It was difficult to assess from the model results how these different types of emissions from a building are treated in the model. For example, it was unclear how you reflected the increase in HFC leakage due to addition of electric heat pumps.

HFC emissions are not explicitly treated in NEAT, but can be embedded in the GHG emission factor by the user for appliances using refrigerants. Refrigerant leakage was discussed in the NEAT Workgroup #5.

- The NEAT model allows the user to zero out the NO_X and GHG emission factors for increased electricity use by choosing the "All additional electricity from centralized photovoltaics, wind, and centralized battery storage" option in the "Power Supply" window. This outcome is unrealistic at the current time. The NEAT model provides a snapshot of the incremental NO_X and GHG emissions around calendar year 2017, when the electric grid mix did not have a high percentage of renewables. The CAISO shows that in 2019, approximately 961 gigawatt-hour (GWh) of solar and wind power was curtailed during periods of over-generation,[1] indicating that electricity from renewable resources are not stored in batteries and cannot be made available 24/7/365 at this time.

  We set the cases for 'all renewables' and 'all peaker plants' as bounding cases, where users can determine the contribution and sensitivity of the results with respect to grid emissions. California has specific goals on achieving renewable penetration in the electric power sector in the following decades, with the goal of 100% renewable by 2050. While those bounding cases may not be realistic at this time, those two options can provide users with additional insight. The bounding cases were extensively discussed during workgroup meetings 3 and 4.

- Similarly, it is unclear how the model treats thermal storage using electric water heaters. There have been parties that suggested the water heaters could be "pre-heated" during high renewables periods for utilization during other parts of the day. The typical usage pattern for a water heater has two peaks, one in the evening and one in the morning. While, the "pre-heat" concept may be able to meet part of the evening peak. It is unlikely it would be able to meet the entire hot water demand, especially the second peak in the morning. Therefore, it's unlikely the all renewables model would actually be able to meet the total demand.

  Thermal storage water heaters are treated the same way as electric water heaters. They are not presumed to use only renewable sources. The way NEAT treats thermal storage water heaters is to shift the electric load to reduce electricity consumption during peak hours, based on available reports. The result is that the temporal profile of thermal storage electric water heaters is different from the conventional water heaters. The total amount of electricity used by thermal storage water heaters is by the UEC value. Inclusion of thermal storage water heaters were discussed extensively in the NEAT workgroup meeting number 6.

[1] California ISO, Managing Oversupply. Available online at: http://www.caiso.com/informed/Pages/ManagingOversupply.aspx. Accessed: February 2020.